Ecological Assessment

Steeple Aston

On Behalf of:

Rectory Homes

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Author	Stephen Parr MCIEEM and Dan Carne BSc (Hons)
Technical Review	Jessica Breeze BSc (Hons) MSc ACIEEM
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Ecology, Countryside Management
Professional Service ● Pragmatic Solutions
phone: 01268 711021 email: team@ses-eco.co.uk website: www.ses-eco.co.uk
Address: The Sudbury Stables, Sudbury Road, Downham, Essex, CM11 1LB

Executive summary

1. This report presents the results of a desk study, and habitat and protected species surveys undertaken at South Side, Steeple Aston in Oxfordshire (the site). The work was carried out to inform a planning application for a 10-unit residential development of the site.

2. The site is located within Cherwell District Council. The site is bordered by rural residential and commercial properties to the north, west, and east, and arable farmland to the south with South Side road running along the northern boundary of the site.

3. There are no European designated sites within 10km however there are three ecologically designated national statutory sites within 5km of the proposed development. No impacts are predicted on these sites.

4. The site consisted primarily of semi-improved grassland with scattered young scrub growth and species-rich boundary hedgerows. It also featured two earth mounds with established scrub and tall ruderal vegetation. There is one building on site.

5. The building was assessed as having low potential for roosting bats due to the presence of extremely dense ivy growth, particularly around the western compartment. Emergence surveys confirmed the absence of any roosting bats. A reptile survey confirmed the absence of all common reptile species from the site.

6. Mitigation measures are provided for construction impacts on the grassland habitat, badgers, foraging and commuting bats, birds, invertebrates, reptiles and European hedgehog.

7. Through implementing the advised mitigation measures and providing a range of enhancements for habitats and protected species through an Ecological Mitigation and Management Plan (EMMP), it is considered that all the proposed development may be delivered in line with relevant wildlife legislation, national planning policy (MHCLG, 2019), and local planning policies related to biodiversity especially policy ESD 10 of the Cherwell Local Plan 2011-2031 (2016).

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Appendices

1.0 Introduction

1.1 Southern Ecological Solutions Ltd. (SES) was commissioned by Rectory Homes Limited to prepare an ecological impact assessment report for land at South Side, Steeple Aston (the site) following the completion of two preliminary ecological assessments (PEA) in 2017 (SES, 2017) and updated in June 2019 (SES, 2019). The site is approximately 1ha, comprising semi-improved grassland, scattered scrub, and tall ruderal vegetation, with boundary hedgerows. The site location is provided in Appendix 1.

1.2 Planning permission is being sought for the demolition of an existing dilapidated shed structure and the construction of 10 residential properties with associated hard standing, amenity gardens, and access road. The proposed site layout in shown in Appendix 2.

1.3 After the second PEA was undertaken in June 2019 by SES, the following surveys were recommended and subsequently carried out between August and September 2019:

- Bats (preliminary ground level tree assessment; emergence/re-entry surveys); and
- Reptile survey.

1.4 This report sets out the results of the above surveys. All features are then evaluated using the evidence from the desk study, field surveys, previous reports and relevant literature. The proposals for development are then set out and the impacts on features are assessed. Mitigation options are then outlined in relation to legal and planning policy obligations and residual impacts assessed.

1.5 The objectives of this preliminary ecological appraisal (PEA) were to:

- Map the main ecological features within the site and compile a plant species list for each habitat type;
- Make an initial assessment of the presence or likely absence of species of conservation concern;
- Identify any legal and planning policy constraints relevant to nature conservation which may affect the development;
- Determine any potential further ecological issues;
- Determine the need for further surveys and mitigation;
- Make recommendations for minimising impacts on biodiversity and providing net gains in biodiversity where possible *in accordance with Chapter 15: Conserving and Enhancing the Natural Environment, of the National Planning Policy Framework (NPPF) (MHCLG, 2019), and policy ESD 10 within the Cherwell Local Plan 2011-2031 (2016).*

1.6 Details of relevant wildlife legislation and planning policies are provided in Appendix 3.

2.0 Methods

2.1 The assessment follows guidance and methods as prescribed by the Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Appraisal 2nd edition (2017) and the Guidelines for Ecological Impact Assessment (2019). Following these methods, a baseline of rare and/or noted ecological receptors (species and habitats) was established and valued. Predicted significant impacts upon these receptors have been identified and constraints and opportunities identified. This step-wise assessment process has informed likely mitigation and enhancement measures. Recommended phase 2 ecological surveys have been identified as well as a timetable for implementation. These surveys will fully inform the predicted impacts of the scheme in accordance with the National Planning Policy Framework (NPPF) (MHCLG, 2019), local planning policy and relevant wildlife legislation.

Desk study

2.2 To support the previous extended Phase 1 Habitat Survey report (SES, 2017), SES commissioned a data search for records of protected and notable species as well as non-statutory designated sites from the Thames Valley Environmental Records Centre (TVERC). The data search encompassed the study area, and up to 2km from the boundary. Data were received from TVERC on 2 November 2017. Given that these results are less than two years old, the results are still considered relevant to this assessment. Hazel dormouse *Muscardinus avellanarius* records were also sought from the National Biodiversity Network (NBN) Atlas, which holds data from the People's Trust for Endangered Species (PTES).

2.3 A web-based search for statutory designated sites via the Multi Agency Geographic Information for the Countryside (MAGIC) spatial data resource www.magic.gov.uk was undertaken on 8 May 2019 for the following designations: European (up to 10km from the site boundary); and national (5km from the site boundary).

2.4 An online search was undertaken for waterbodies within 500m of the site boundary utilising MAGIC Map on 8 May 2019.

Extended Phase 1 Habitat Survey

2.5 An extended Phase 1 Habitat Survey was carried out on 9 May 2019 by suitably qualified ecologist Dan Carne BSc (Hons) in appropriate weather conditions. This is a standard technique for obtaining baseline ecological information for areas of land, including proposed development sites. Phase 1 Habitat Survey methods are set out in the *Handbook for Phase 1 Habitat Survey* (Joint Nature Conservation Committee, 2010). Habitat mapping was undertaken using the standard classification to indicate habitat types.

2.6 The dominant and readily identifiable higher plant species identified in each of the various habitat parcels were recorded and their abundances assessed on the DAFOR scale:

- D - Dominant
- A - Abundant
- F - Frequent
- O - Occasional
- R - Rare

2.7 These scores represent the abundance within the defined area only and do not reflect national or regional abundances. Plant species nomenclature follows Stace (2010).

2.8 All impacts upon ecological features have been considered for the purposes of this survey following industry best practice guidance. Only relevant protected and notable species have been discussed within this report to keep its contents concise and relevant to the works being undertaken and for ease of application.

Badger

2.9 A survey and assessment was made to identify areas that might be used by badgers *Meles meles* for foraging, commuting and sett creation.

Bats

Preliminary assessment

2.10 The site was initially assessed for its suitability to support roosting, foraging and commuting bats during the extended Phase 1 Habitat Survey. All existing habitats were assessed for suitability for bats using guidelines issued by the Bat Conservation Trust (Collins, 2016).

2.11 Building interiors were searched for evidence of roosting bats using high powered torches. Evidence of bat occupation sought included the physical presence of bats, droppings, urine staining and mammalian oil staining. Detailed survey methods are provided in Appendix 4.

Emergence/re-entry surveys

2.12 The preliminary assessment identified the building on site as having 'low' suitability for bats. Therefore, in accordance with current guidance (Collins, 2016), a further emergence survey was conducted on 24 June 2019. Surveyors used bat detectors in combination with visual observation to record bat activity. Detailed methods are provided in Appendix 4.

2.13 Both buildings were also re-inspected for evidence of roosting bats on 24 June 2019, prior to the emergence survey visit.

Birds

2.14 The site was assessed for its potential to support breeding birds and significant wintering and/or migratory bird populations during the extended Phase 1 Habitat Survey. Suitable habitat generally includes scrub and trees but can also include buildings, open grassland and piles of debris.

Great crested newt

2.15 Aquatic habitats in the vicinity of the site were assessed for their suitability to support breeding great crested newts (as well as other amphibians) using the Habitat Suitability Index (HSI). Further detail on the HSI method is provided in Appendix 4.

2.16 Terrestrial habitats were also assessed for their suitability for great crested newt during the extended Phase 1 Habitat Survey. Suitable terrestrial habitat generally includes rough grassland and woodland where they can forage and hibernate, with good links to the ponds where they breed.

2.17 In addition, the NatureSpace (2018a) South Midlands Impact Risk Zones map, developed for the South Midlands GCN district licensing scheme, was referred to in order to determine the likelihood of great crested newt presence within the local landscape.

Hazel dormouse

2.18 Habitats were assessed for their general suitability for hazel dormouse during the extended Phase 1 Habitat Survey. This species generally uses areas of dense woody vegetation and are more likely to be found where there is a wide diversity of woody species contributing to a three-dimensional habitat structure, a number of food sources, plants suitable for nest-building materials and good habitat connectivity.

Invertebrates

2.19 The site was assessed for its potential to support rare or notable invertebrate species.

Other notable species

2.20 The site was assessed for its potential to support species of principal importance listed under the UK Natural Environment and Rural Communities NERC Act 2006 which are likely to occur in the local area.

Reptiles

Preliminary assessment

2.21 The site was assessed for its suitability for the four most common reptile species; common lizard *Zootoca vivipara*, slow-worm *Anguis fragilis*, grass snake *Natrix natrix* and adder *Vipera berus*. Specific habitat requirements vary between species. Common lizard favour rough grassland, however they can be found in a variety of habitats ranging from woodland glades to walls and pastures. Slow-worms use similar habitats to common lizards and are often found in gardens and derelict land. Grass snake have similar habitat requirements to common lizards but have a greater reliance on ponds and wetlands where they hunt amphibians. Adders occupy areas of rough, open countryside and are often associated with woodland edges.

Reptile survey

2.22 A seven-visit presence and likely absence survey was undertaken during 'suitable' days for reptile activity between August to September 2018. This survey method followed best practice guidance (Froglife, 1999; Gent & Gibson, 2003). Further detail on the reptile survey method is provided in Appendix 4.

Assessment of Nature Conservation Value

2.23 CIEEM guidelines for Ecological Assessment in the United Kingdom (2019) have been utilised to assess the impacts upon habitats within the zone of influence of the site. CIEEM suggests that it is best to use the geographical scale (i.e. international, national, regional etc.) at which a feature (i.e. a habitat, species or

other ecological resource) may or may not be important as the appropriate measure of value. As such, data from the data search and extended Phase 1 habitat survey have been reviewed and the likely occurrence of protected and notable species/species groups assessed. This has allowed predictions of impacts to be made along with recommendations for mitigation, compensation and enhancement. Further targeted survey will refine the evaluation and associated recommendations.

2.24 The following geographical scale categories are considered appropriate:

- International;
- National (England);
- Regional (South-east);
- County (Buckinghamshire);
- District (Aylesbury Vale);
- Local (Chearsley); and
- Site.

Constraints

2.25 Reptile surveys were undertaken between July and August in accordance with guidance (Froglife, 1999). Surveys in July/early August are generally not recommended as these are the hottest months of the year and reptiles often seek shade during the day, reducing the efficacy of artificial refuges. This is not considered to have been a significant constraint as all surveys were undertaken in appropriate weather conditions. Furthermore, three out of the seven surveys were undertaken in the latter half of August when juvenile animals would likely have been active if present on site.

2.26 Desktop data searches are a valuable tool in evaluating a site's potential to hold rare and protected species, it is not however an absolute in confirming presence or absence of notable species due to the nature of how the records are collected. This is not considered to significantly constrain the recommendations of this report given the common habitat types present and the detailed site visit.

2.27 The bat surveys were completed with the assistance of bat detectors. Surveys using bat detectors have an advantage over other methodologies (such as radio tracking or trapping) in that they are 'non-intrusive' and will therefore not have an adverse effect on the conservation status or welfare of bats. However, all survey techniques for bats are subject to bias and bat detector surveys may under record species with weak echolocation calls, such as brown long-eared bats. Bats from the *Myotis* genus can be difficult to identify to species from call structure alone (Russ, 2012).

3.0 Baseline ecological conditions

Site description

3.1 The site consisted primarily of semi-improved grassland with scattered young scrub growth. There were areas of established scattered scrub and tall ruderal vegetation upon two earth mounds positioned centrally within the site. The boundary habitats featured species-rich hedgerows, with a line of mature beech *Fagus sylvatica* trees on the far side of the eastern site boundary. There is a disused single storey building in the north-west corner of the site. The site was bordered to the north by South Side road, with arable farmland to the south and rural residential and commercial properties to the north, east, and west. In a wider context, the surrounding environment is comprised of a mixed farmland mosaic featuring small areas of woodland, with residential development associated with Steeple Aston to the north and east.

Designated sites

European designated sites

3.2 There are no European designated sites within 10km of the site boundary and therefore these are not considered further in this assessment. The site does not fall within any European designated site Natural England Impact Risk Zones (IRZ).

Nationally designated sites

3.3 There were four nationally designated sites within 5km, including three Sites of Special Scientific Interest (SSSI) and one Local Nature Reserve (LNR). Details of all statutory designated sites within 5km of the site are provided in Table 2. The site falls within the IRZ of Middle Barton Fen SSSI but does not qualify for any of the relevant criteria due to the nature of the development.

3.4 SSSIs are considered important at a **national** level, and LNRs are considered important at a **county** level.

Non-statutory designated sites

3.5 There are two non-statutory designated sites within 2km (Table 2). Glyme and Dorne Valleys Conservation Target Area (CTA) is the closest at approximately 0.9km to the south-west. Given the distance of CTA from the site, these are not considered further in this assessment.

3.6 CTAs are considered important at a **local** level.

Table 1: Statutory Designated Sites within the vicinity of the site

Name and Site Designation	Approximate Distance and Direction from Site	Size (Ha.)	Designated Features
UK Statutory Designated Sites			
Horsehay Quarries SSSI	1.7km north-west.	8.2	The site is designated for its geological significance rather than any ecology value.
Middle Barton Fen SSSI	2.3km north-west.	11.3	This site comprises calcareous fen-meadow with limestone grassland and hedgerows and is the most extensive example of calcareous fen-meadow currently known in Oxfordshire. The site is designated for its priority habitats and rich invertebrate assemblage.
Bestmoor SSSI	4.3km north-east.	12.4	Semi-improved floodplain meadow designated for its specialist plant assemblage, wintering waterfowl, as well as having one of the largest known British populations of the nationally scarce narrow-leaved water dropwort *Oenanthe silafolia*.
Crecy Hill LNR	4.4km south	0.84	A limestone bank with a varied calcareous grassland flora and rich invertebrate assemblage.
Non-Statutory Designated Sites			
Glyme and Dorn Valleys CTA	Nearest point is 0.9km south-west.	2496	The CTA is comprised of the whole Glyme Valley from its source near Chipping Norton to Blenheim Park and including some tributary valleys, especially the Dorn. The CTA includes several SSSI and LWS sites, and supports limestone grassland, lowland meadow, fen/swamp/reedbed, woodland, river, and standing water habitats.
Upper Cherwell Valley CTA	Nearest point 1.2km south-east.	451	The CTA is comprised of the Cherwell Valley from Lower Heyford to Clifton. It includes several SSSI and LWS sites, and supports species such as otter, water vole, and several BAP bird species.

SSSI: Site of Special Scientific Interest
CTA: Conservation Target Area

Habitats

3.7 The Phase 1 Habitat map of the site is provided within Appendix 5 and the plant species recorded per habitat type are tabled in Appendix 6.

3.8 The Phase 1 Habitat types (JNCC, 2010) within the site were:

- Semi-improved grassland;
- Scattered scrub;
- Tall ruderal vegetation;
- Hedgerows; and
- Hard standing with ephemeral vegetation

Semi-improved grassland

3.9 The site, which was previously bare ground in 2017, consisted primarily of semi-improved grassland with scattered young tree growth. This habitat featured a moderately diverse range of species typical of this transitional grassland habitat, such as false oat-grass *Arrhenatherum elatius*, tall feascue *Festuca arundinacea*, pyramidal orchid *Anacamptis pyramidalis*, and hairy tare *Vicia hirsuta*. The grassland had a variable sward, featuring areas of tall tussocky grassland (30-90cm) as well as areas of short vegetation (5-15cm) dominated by rough hawkbit *Leontodon hispidus*. There were several piles of woody vegetation scattered throughout the grassland.

Scattered scrub

3.10 Two areas of established scattered scrub featuring frequent ash *Fraxinus excelsior* and bramble *Rubus fruticosus* were located centrally within the site on and around earth mounds, interspersed with tall ruderal vegetation. Further scattered scrub was located in the north-western corner of the site, around and within the disused barn/shed structure. This area featured a similar range of species. The scattered young tree growth within the semi-improved grassland will develop into scrub in the next few years without management.

Tall ruderal vegetation

3.11 There were three distinct areas of tall ruderal vegetation on site, one adjoining the southern edge of the hardstanding near the access gate along the northern boundary, and two positioned centrally within the site interspersed with scattered scrub. This habitat consisted mainly of common nettle *Urtica dioica*.

Hedgerows

3.12 There were hedgerows along parts of the northern, eastern, southern, and western boundary of the site. Most of the hedgerows on site featured a range of native species, with the exception of the eastern hedge, which consisted of beech *Fagus sylvatica* and Portugese laurel *Prunus lusitanica*. The hedgerows along the northern and southern boundaries were particularly diverse, and the southern boundary hedge also featured climbing plants such as dog rose *Rosa canina* and traveller's joy *Clematis vitalba*. Most of the hedgerows on site are well-established with a dense structure, though the southern hedgerow appears to have been more recently planted and has an open structure, without any trees along its length.

Hard standing with ephemeral vegetation

3.13 There was an area of hard standing adjacent to the site entrance along the northern boundary, with scattered ephemeral vegetation and several piles of rubble and spoil. This habitat featured common and widespread species such as lesser burdock *Arctium minus* and smooth sow-thistle *Sonchus oleraceus*.

Summary

3.14 The hedgerows on site are considered to be of moderate ecological value, important at a **local** level, with confidence in this assessment high. The remaining habitats within the site also offer wildlife value, however given the small size of the site, together with the transitory nature of the habitats present, these are considered to be important at only a **site** level, with confidence in this assessment high

Protected habitats and flora

Species-rich hedgerows

3.15 Most of the hedgerows on site (with the exception of the east hedge) were considered to meet the definition for classification as UK NERC Act (2006) habitat of principal importance, (i.e. more than 80% UK native woody species) (JNCC, 2008) (Table 3). The native species hedgerows were each found to contain more than five woody species, and hence likely to qualify as 'important' under the wildlife criteria of *The Hedgerow Regulations 1997*.

3.16 Given that most of the hedgerows on site are considered to qualify as 'important', and their value in landscape connectivity, this habitat is considered to be of **local** importance. Confidence in this assessment is high.

Open mosaic on previously developed land

3.17 The semi-improved grassland displays moderate botanical diversity, though the species present are typical of recently disturbed area. This habitat is transitional with encroaching scrub already present. The site has the potential to meet the criteria of the UK NERC Act (2006) habitat of principal importance 'open mosaic on previously developed land' as the majority of the site comprises bare ground that has colonised with grassland and ruderal vegetation. Table 3 provides the criteria published by JNCC for meeting this habitat definition and comments on whether habitats at the site qualify.

Table 2: Criteria for UK NERC Act (2006) habitat 'open mosaic on previously developed land'

	Criterion	Does the development site meet criteria?
1	The area of open mosaic habitat is at least 0.25ha in size.	Yes – habitats in question cover approximately 0.78ha of the site.
2	Known history of disturbance at the site or evidence that soil has been removed or severely modified by previous use(s) of the site. Extraneous materials/substrates such as industrial spoil may have been added.	Yes – the site previously comprised bare ground, and there is evidence that soil has been removed (i.e. spoil piles).
3	The site contains some vegetation. This will comprise early successional communities consisting mainly of stress-tolerant species (e.g. indicative of low nutrient status or drought). Early successional communities are composed of (a) annuals, or (b) mosses/liverworts, or (c) lichens, or (d) ruderals, or (e) inundation species, or (f) open grassland, or (g) flower-rich grassland, or (h) heathland.	In part – the habitat in question comprises annuals, grassland and ruderal vegetation that has recently colonised bare ground. There was a lack of mosses/liverworts, inundation vegetation and heathland.
4	The site contains unvegetated, loose bare substrate and pools may be present.	In part – there was a general lack of loose, bare substrate and the majority of the bare ground was tightly compacted. Pools were absent.
5	The site shows spatial variation, forming a mosaic of one or more of the early successional communities (a)–(h) above (criterion 3) plus bare substrate, within 0.25ha.	No – the habitat in question was dominated by grassland, with small patches of ruderal vegetation interspersed. The habitat did not create a mosaic and lacked a number of the early successional communities described in criteria 3.

3.18 Therefore, although the site meets some of the above criteria, it does not qualify under all and does not meet the definition for an open mosaic habitat. The ongoing lack of management will also mean that the site eventually becomes dominated by dense bramble, further reducing the number of qualifying features.

Rare, notable and invasive plants

3.19 The 2017 data search with TVERC returned records of *Schedule 8* protected species bluebell *Hyacinthoides non-scripta* within 2km of the site. There was one record of *Schedule 9* invasive species Himalayan balsam *Impatiens glandulifera* within 2km of the site, dated 1977-1986. No species listed under Schedule *8* or *Schedule 9* of the *WCA 1981* were recorded on site.

3.20 Generally, flora recorded during the Phase 1 survey comprised of widespread species that are frequently associated with the habitats present on site. The site is considered to be of **site** importance for rare and

notable flora. Confidence in this assessment is high, due to the common habitats and moderate species diversity on site.

Protected and notable species

Badger

3.21 There were five badger records within 2km of site, most recently in 2009. No badger setts or field signs such as badger tracks, hairs, and snuffle marks were observed during the survey. The site contains extensive opportunities for future sett-building in the form of the earth mounds and earth bank positioned centrally within the site (Appendix 5). The site offers excellent foraging/commuting habitat for badgers but given that the site only covers an area of approximately 1ha and no badger field signs were recorded, it is considered important at only a **site** level, with confidence in this assessment high.

Bats

Desk Study

3.22 Records of bats identified within 2km of the site are summarised in Table 2 below.

Table 3: Records of bat species within 2km of the site boundary

Bat species	Number of records	Last recorded (c. distance from site)
Brown long-eared *Plecotus auritus*	1	1997
Common pipistrelle *Pipistrellus pipistrellus*	3	2014

Preliminary Assessment – Roosting Bats

3.23 Trees on site were inspected from ground level; all trees on site were considered to have negligible potential to support a bat roost. Trees with negligible potential have not been included in this report.

3.24 There was one single-storey dilapidated building located in the north-west corner of the site. It is of stone construction with a slightly pitched and partially collapsed roof and an open southern aspect. The building is divided into several internal compartments. Generally, it is in a poor state of repair, with dense ivy growth covering most of the building. The western compartment was completely obscured by ivy growth, which was considered sufficiently dense to offer potential roosting opportunities between the thick mass of vegetation and the building walls. This building was considered to have **low** suitability for roosting bats.

Preliminary Assessment - Foraging/Commuting Bats

3.25 The habitats within the site are considered to provide moderate suitability habitat for foraging and/commuting bats, with the boundary hedgerows the most valuable areas of the site. Collectively, these are likely to provide a valuable habitat corridor for bats commuting/foraging between nearby areas of suitable habitat. The boundary habitats on site are not due to be affected by the proposed works.

Emergence/Re-entry Surveys

3.26 A single dusk emergence survey was carried out on the building on 24 June 2019 and recorded no emergence or re-entry. The building is therefore not considered to support roosting bats and the site is considered to be of **negligible** importance for roosting bats, with confidence in this assessment high.

3.27 The emergence survey also confirmed one further species of bat using the site for commuting/foraging; noctule bat *Nyctalus noctula*. Surveyor positions during the emergence survey are provided in Appendix 7.

Birds

3.28 There were records of 40 bird species within 2km of the site; 19 of which were red-listed birds of conservation concern (BoCC) (Eaton *et al.* 2015). The majority of the site does not offer potential nesting habitat for birds. However, the boundary hedgerows and scattered scrub offer potential nesting habitat suitable for an array of bird species, including some species of conservation concern such as dunnock *Prunella modularis* (amber listed) and song thrush *Turdus philomelos* (red-listed) (Eaton et al. 2015). However, these habitats are locally abundant, and the boundary hedgerows are due to be retained on site.

3.29 It is considered that the site does not support notable assemblages of Schedule 1 birds or Red list BoCC, due to the small scale of the site. The existing buildings, with various small gaps noted within the roof structures, may also offer some opportunities for species such as house sparrow. However, with no large open access, it is unsuitable to support Schedule 1-listed barn owl.

3.30 With on-site habitats ubiquitous of those found across the surrounding landscape, the site is considered to be of **site** value for breeding birds; confidence in this assessment is high.

Great crested newt

3.31 The data search returned a single record within 2km of the site boundary, in 2002, 1.8km south. It is considered that any individuals in this area would not disperse onto site, given the distance and abundance of suitable habitat near to the record. The absence of more recent records may reflect the absence of individuals in the local area or may simply result from a lack of recording. No aquatic habitats were present on site, though the site offers extensive suitable terrestrial habitat for great crested newt in the form of rough grassland, scrub, and hedgerows. Additionally, the rubble piles, vegetation piles, and the dry-stone wall along the north-eastern boundary may act as suitable refugia.

3.32 Two potential water bodies were identified within 250m of the site boundary using MAGIC (Appendix 8). Ponds were not accessed during the survey due to access restrictions. Research undertaken by English Nature (Cresswell, 2004), now Natural England, suggests it is most common to encounter great crested newt within 50m of a breeding pond, with few moving further than 100m unless significant linear features are involved when animals may be encountered at distances of between 150m – 200m. The closest waterbody is located c.200m north of the site. A drainage stream exists directly to the south of the ponds. The stream was fast flowing and c.0.6m deep. As such, it is considered that the stream represents a significant barrier to dispersal. Additionally, the South Side road and residential housing between the ponds and the site represent further minor barriers to dispersal.

3.33 Given the presence of these dispersal barriers and the distances involved, if great crested newt was present within these water bodies, it is considered highly unlikely that they would disperse onto site; as such, the site is considered to be of **negligible** importance for great crested newt and confidence in this assessment is currently high. Further surveys are not considered necessary and great crested newt is not considered further in this assessment.

Hazel Dormice

3.34 There were no records of dormouse within 2km of the site, and the NBN Atlas search did not return any records within 10km of the site.

3.35 The site is considered to provide very limited opportunities for dormouse; preferred habitats for the species (woodland with developed understorey and species-rich complex-structured hedgerow) were not present.

3.36 Given the absence of suitable habitat and lack of records within the local area, it is considered highly unlikely that dormouse is present on site, and further surveys are not required. The site is considered to be of **negligible** value for hazel dormouse and this species is not considered further in this report.

Invertebrates

3.37 The semi-improved grassland and scrub habitats on site offer habitat suitable for invertebrates, and moderate invertebrate diversity was observed during the site visit. The scrub and hedgerows contained some deadwood suitable for saproxylic invertebrates. The semi-improved grassland was structurally diverse across the site, with some areas of tussocky grassland and others more sparsely vegetated. However, given the small size of the site and the relative abundance of these habitats within the local area, it is considered unlikely that the site supports any assemblages of rare/noted invertebrates significant at a local level. It is important to note that the habitats recorded on site were transitional, and if the present lack of management continues, the site will consist primarily of dense scrub within a few years. The site is therefore considered to be of only **site** importance, with confidence in this assessment high.

Reptiles

3.38 A single record of grass snake *Natrix natrix* was recorded within 2km of the site boundary in 2012, 1.5km south. This species is very mobile and, if present in the local area, it is likely to make use of areas of suitable habitat. The lack of records of other reptile species may indicate that they are absent from the local area or may result from a lack of local recording efforts. In general, the site is ecologically well connected to the wider environment through hedgerows and field margins. It is therefore considered that individuals in the wider landscape could disperse onto site using these habitat corridors.

3.39 The site offered suitable habitat for reptiles in the form of semi-improved grassland, scrub, hedgerows, and numerous potential hibernacula such as the dry stone wall in the north-east corner, the rubble piles near the northern boundary, and the vegetation piles distributed across the site. The semi-improved grassland displayed structural diversity, with sparsely vegetated areas ideal for basking as well as more tussocky areas suitable for sheltering and foraging.

3.40 A reptile survey was conducted between July and August 2019 and recorded no reptile presence within the site (Appendix 9). Reptiles are therefore considered unlikely to be present on site, though it is possible that small numbers of transitory individuals may make use of the site, particularly given that grass snake are known to be present within the wider environment. The site is therefore considered to be of **site** importance for reptiles. Confidence in this assessment is high.

Other notable species

3.41 A single record of brown hare *Lepus europaeus* was recorded in 2003 2km north of site. Brown hare could utilise some areas of the site (hedgerow margins and semi-improved grassland), but the site only covers a small area, and is likely to be less significant for this species than the extensive arable fields and field margins in the surrounding environment. No field signs of brown hare were observed during the site visit.

3.42 Habitats on site (hedgerows, scrub, semi-improved grassland) are considered to provide suitable foraging and sheltering habitat for European hedgehog *Erinaceus europaeus*, common toad *Bufo bufo*, and western polecat *Mustela putorius.* No field signs of any of these species were found on site, and western polecat have only recently begun to recolonise north-western Oxfordshire, having previously been extirpated. However, the habitats on site are suitable and are likely used by hedgehogs and polecats, if these are present within the local area. Common toad could also feasibly use the habitats on site for foraging and hibernating, however this species is considered unlikely to be present on site given the lack of suitably connected potential breeding ponds within the wider environment. The boundary habitats offer connectivity between further areas of suitable habitat off site, however the habitats present are ubiquitous within the local area and the site is considered to be of only **site** importance for other notable species. Confidence in this assessment is high.

Summary

Table 4: Summary Evaluation of Features

Feature	Summary Description	Importance	Confidence
SSSI/LNR	Three ecological statutory designated sites. Middle Barton Fen SSSI 2.3km north-west.	National	High
Non-statutory designated sites	Two non-statutory designated sites. Glyme and Dorn Valleys CTA 0.9km south-west.	Local	HIgh
Rare and notable flora	Common and widespread species only.	Site	High
Priority Habitats	Boundary hedgerow (north, south and west boundaries)	Local	High
Other Habitats	Semi-improved grassland, scrub, tall ruderal vegetation and non-native species hedgerow (east boundary)	Site	High
Badger	No setts present but the site provides suitable sett building, foraging and commuting habitat.	Site	High
Bats - foraging	Foraging/commuting potential restricted to boundary habitat.	Local	High
Birds - breeding	Potential nesting of common and protected species in hedgerows and scattered scrub.	Site	High
Invertebrates	Habitats of moderate invertebrate value, value likely to degrade if unmanaged	Site	High
Reptiles	Suitable habitats may be used by small numbers of reptiles.	Site	High
Other notable species	Habitats suitable for European hedgehog, common toad, and western polecat, and may also be used by individual brown hare.	Site	High

4.0 Impacts, mitigation and enhancement measures

Description of proposals

4.1 The proposal for the site is for the construction of 10 new residential properties, with associated access and parking areas. The works will also involve the demolition of the existing building on site. The proposal involves the loss of the habitats on site except for the boundary hedgerows which are to be retained. The proposals include the provision of a small area of public green space along the northern boundary (Appendix 2).

Designated sites

Impacts

4.2 It is considered that all statutory designated sites are at such a distance that direct impacts such as pollution, disturbance or habitat loss during the construction phase will not occur. Recreational impacts from a development of 10 residential units are unlikely to be discernible and will be further reduced by the distances involved and the abundance of potential walking routes within the immediate surroundings. Construction and operational impacts are therefore predicted to be **negligible**.

Mitigation

4.3 It is not considered that any further information to inform an Appropriate Assessment under the Habitats Regulations (2017) is necessary to support this application nor any additional assessment on effects on other nationally and locally designated sites. No mitigation for designated sites is considered to be required.

Residual Effects

4.4 Construction and operational phase impacts are considered **negligible.**

4.5 Residual effects upon statutory and non-statutory designated sites will be **neutral.**

Habitats

Impacts

4.6 The boundary hedgerows are to be retained where possible, though the loss of a small area is expected to accommodate visibility splays for the new access road and footpath (Appendix 2). It is also anticipated that some immature trees and scattered scrub will be removed as a result of the proposed development. Loss of habitat associated with tree clearance, together with the potential for damage to retained tree roots during construction has the potential to have an adverse impact and indirect impacts of increased lighting levels during construction and occupation are possible. These potential impacts are considered **adverse** effects at the **site** level, given the small size of the site and minor nature of the damage.

4.7 Site clearance will result in the loss of the tall ruderal habitat, as well as most of the semi-improved grassland on site. The tall ruderal vegetation is considered to be of minimal ecological value, however

the loss of the moderately diverse semi-improved grassland will have an **adverse** impact at a **site** level, though it should be noted that this habitat is transitory and would eventually become scrub if it is continued to be left unmanaged.

Mitigation

4.8 It is recommended that the trees and hedgerows which are to be retained, as well as the beech trees beyond the western boundary, are protected during works through the provision of suitable fencing such as Heras fencing.

4.9 Retained hedgerows will be enhanced through supplementary planting and a long-term management regime. The proposed layout also includes provision of boundary planting along the new internal boundaries of the development. Planting will comprise native species such as those listed in Appendix 10.

4.10 The hedgerows bordering areas of public open space will be managed through rotational cutting to further enhance their value for wildlife. A rotation where no more than half of the hedgerows are trimmed in any one year is considered appropriate, with longer rotations of up to five-yearly cuts providing even greater wildlife value.

4.11 The proposed development will result in the loss of most of the semi-improved grassland on site. This habitat is transitional and would eventually become scrub in the absence of management. The proposed layout includes the provision of open green space north of the access road, along the northern boundary of the site. Topsoil or turf from the existing semi-improved grassland on site will be retained and spread over a significant proportion of the proposed areas of public green space in order to ensure that the seed bank is preserved post-construction. Further provision will be made for the ongoing management of this habitat as wildflower-rich, semi-improved grassland through annual cutting in late summer. Cuttings should be piled in a different area of the site in order to prevent nutrient enrichment of the grassland

4.12 Where possible, new external lighting will be avoided in the redevelopment of the site. If this is required, a sensitive strategy that avoids lighting of the trees along the far side of the road and the western boundary will be implemented to help mitigate potential indirect impacts on protected species such as bats utilising the boundary habitats (also of benefit to a wide range of invertebrate species). Further details are outlined within the bats section below.

Residual Effects

4.13 The retention of existing hedgerows and further planting of native species is likely to provide adequate mitigation to the loss of scattered scrub habitat on site. Together with the provision of a long-term management plan to ensure the continued provision of an area of semi-improved grassland on site, the proposed development is predicted to result in a **neutral** residual effect at site level.

Badgers

Impacts

4.14 The habitats on site (semi-improved grassland, hedgerows, scattered scrub) provide foraging opportunities for badgers. As such, potential impacts are limited to badger death/injury during construction.

Mitigation

4.15 To mitigate against the loss of foraging habitat expected to result from the proposed development, the landscaping plan will feature fruit and seed-bearing tree species (such as crab apple *Malus sylvestris*, elder *Sambucus nigra* and rowan *Sorbus aucuparia)* are included in the landscape plans. Traffic control measures such as a reduced speed limit and/or other speed control measures such as speed bumps are advised in order to reduce the risk presented by increased traffic and the new access road.

4.16 The following precautionary techniques that are sympathetic to badgers are also recommended:

- Covering trenches at night or leaving a plank of wood leant against the side to ensure badgers can escape if they were to accidentally fall in;
- Covering open pipework with a diameter of greater than 120mm at the end of the work day to prevent animals from entering and becoming trapped;
- Storing chemicals according to COSHH regulations overnight and covering them if left unattended at any time;
- Regular removal of litter

4.17 Due to the propensity of badger to move around the landscape and dig out old setts / open new ones, A pre-construction walkover will be undertaken no more than 12 months prior to the start of development. If an active sett is found, a licence may be required to close the sett if it is to be impacted by the development.

Residual Effects

4.18 These mitigation measures will result in a **neutral** residual effect on badgers.

Bats

Impacts

4.19 The building does not support a bat roost and may be demolished without any further actions. However, there is potential for the bat assemblage currently utilising the site for foraging and commuting to be adversely affected through increases in artificial lighting and habitat loss during the construction phase. Impacts could disrupt dark areas present along hedgerows and amongst tree canopies within and surrounding the site. This would constitute an **adverse** effect at the **local** level.

4.20 During the occupation phase, there is potential for indirect effects through increased light levels which could result in the abandonment of foraging and commuting pathways, which would constitute an **adverse** effect at the **local** level.

Mitigation

4.21 It is unlikely that the habitats on site represent the core foraging areas for the bats roosting within the barn; more likely the shrubs and trees around the site are used briefly for foraging near the roost, then for dispersal into the wider landscape where more suitable habitats, e.g. woodland, are available. Proposals have therefore sought to retain the larger trees on site and to plant new areas of hedgerow, to maintain connectivity to the wider landscape post-development.

4.22 The boundary vegetation on site is considered to be of moderate importance for foraging and/or commuting bats. Proposals have therefore sought to retain these habitats post-development where possible. Retained hedgerows will be enhanced through supplementary planting and a rotational management regime. In addition, the proposal features new hedgerow planting along internal boundaries (Appendix 2). Landscaping will provide plants of benefit to wildlife and particularly bats; a list is provided in Appendix 10. Activity surveys are not considered necessary to inform mitigation given the small size of the site and the fact that the boundary vegetation is generally being retained and enhanced.

4.23 The indirect impact of artificial lighting requires mitigation to ensure the local bat population are protected from disturbance. Particular care should be taken to retain dark corridors. To minimise detrimental effects of light pollution on local bat populations, mitigation will include:

- Minimising the lighting levels across habitats of where potential foraging/commuting corridors are situated (*i.e.* around trees and hedgerows) especially all boundary habitats;
- Minimising spill of light with the use of directional luminaires, shields, baffles and louvers to direct light where it is needed and prevent light being directed over and around the features concerned, *e.g.* avoid backlighting and overspill onto tree lines, and;
- Orientating the pitch of light away from any potential bat foraging/commuting corridors to allow a dark corridor to persist.

4.24 Site lighting around key features likely to be used by roosting, foraging or commuting bats will be avoided during both the construction and occupation phases. If lighting is necessary, then there are a number of ways to minimise the effect of lighting on bats (and other nocturnal species such as badgers and owls). The following mitigation strategies have been taken from the Institution of Lighting Professionals and Bat Conservation Trust's Guidance Note 08/18 Bats and artificial lighting in the UK (2018) and other referenced sources:

- In general, light sources will not emit ultra-violet light to avoid attracting insects and thus potentially reducing numbers in adjacent areas, which bats may use for foraging. Metal halide and fluorescent sources will not be used.
- LED luminaires will be used where possible. A warm white spectrum (ideally <2700Kelvin) will be adopted to reduce blue light component. Luminaires will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats (Stone, 2012).

- The height of lighting columns will be limited to 8m and the spacing of lighting columns will be increased to reduce spill of light into unwanted areas such as hedgerows and trees (Fure, 2006). Only luminaires with an upward light ratio of 0% and with good optical control will be used. Luminaires will always be mounted on the horizontal, *i.e.* no upward tilt.
- Other ways to reduce light spill include the use of directional luminaires, shields, baffles and/or louvres. Flat, cut-off lanterns are best. Additionally, lights will be located away from reflective surfaces where the reflection of light will spill onto potential foraging/commuting corridors. Internal luminaires can be recessed where installed in proximity to windows to reduce glare and light spill. Where windows and glass facades etc. cannot be avoided, low transmission glazing treatments may be a suitable option in achieving reduced illuminance targets.
- Lighting that is required for security or access will use a lamp of no greater than 2000 lumens (150 Watts) and be PIR sensor activated on a short timer (1 minute), to ensure that the lights are only on when required and turned off when not in use (Jones, 2000; Hundt, 2012). A control management system can be used to dim (typically to 25% or less) or turn off groups of lights when not in use.

4.25 The site will be enhanced for roosting bats through the inclusion of two bat boxes within the proposed development. These could be located either on/within the fabric of buildings (e.g. garages) or mounted on trees due to be retained. There are numerous bat box designs but the Habibat 001 Bespoke (www.habibat.co.uk) provides excellent summer roosting conditions for crevice inhabiting species including common pipistrelle and Naterrer's bat *Myotis nattereri*. Furthermore, no maintenance is required. See Figure 1 for an illustration.

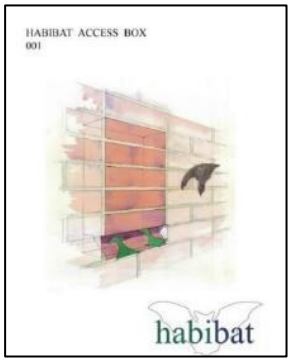

Figure 1: Habibat Integrated Bat Box

Residual Effects

4.26 With the above mitigation in place, residual impacts on foraging/commuting bats are considered to be reduced to **neutral.** With the provision of two new bat roosting features on site, it is predicted that the residual effects upon bat populations will be **beneficial** at a site level.

Birds

Impacts

4.27 Potential impacts on nesting birds include death, damage to and disturbance of nests during the construction phase, as well as a los of nesting and foraging habitat.

Mitigation

4.28 The majority of the existing trees on site will be retained to avoid impacts. The loss of nesting and foraging habitat will be mitigated for through the inclusion of native species planting within the development along internal boundaries and the proposed planting buffers along the southern and eastern external boundary hedgerows.

4.29 Where any clearance or cutting back of small areas of potential bird nesting bird habitat (trees, scrub, tussocky grassland) is required, this will be undertaken outside the nesting bird season (March to August inclusive), or only once a habitat inspection has been carried out by a suitably qualified ecologist immediately prior to clearance.

4.30 Given that it will take time for newly planted trees and hedges to develop into potential nesting bird habitat, bird-nesting features or boxes will be installed on site to provide additional nesting sites. Appropriate locations should be advised by an appropriately qualified ecologist. The following selection of boxes is recommended in order to cater for a range of bird species:

- 4 x swift *Apus apus* integrated bricks on buildings
- 3 x house sparrow *Passer domesticus* terrace boxes (32mm hole x 3) on buildings

Figure 2: Mansthorpe swift brick

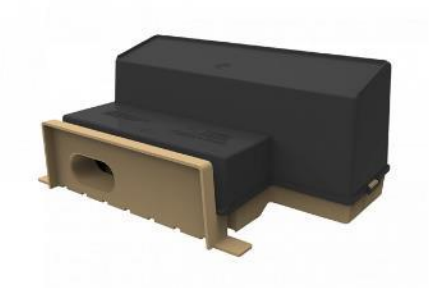

Figure 3: 1SP Schwegler Sparrow Terrace box

Figure 4: NHBS swift brick with custom facing.

Residual Effects

4.31 These mitigation measures will result in a long-term **beneficial** residual effect on birds.

Invertebrates

Impacts

4.32 The proposed development will result in the loss of most of the invertebrate-rich semi-improved grassland on site, however this habitat is transitory and will eventually develop into dense scrub if current management practices continue.

Mitigation

4.33 The proposed layout includes the provision of a strip of open green space along the northern boundary, between the northern hedgerow and the access road. In addition, the established trees and hedgerows on site will be retained where possible to minimise impacts. A sensitive lighting scheme will be employed for any new lighting required that avoids direct lighting of tree canopies and natural boundary features (see section 4.24). The proposal includes the provision of a planting buffer along the southern and eastern boundaries which will mitigate for the minor loss of scrub and hedgerows, as well as helping to minimise the impacts of nocturnal lighting.

4.34 Topsoil or turf from the existing semi-improved grassland will be retained and spread over the proposed area of green space to preserve the seed bank and ensure the continued provision of nectar-rich semi-improved grassland. The existing boundary hedgerows are due to be retained where possible and hedgerow clearance will be kept to a minimum, excepting a small amount required for visibility splays. Any dead wood which is generated through hedgerow and scrub clearance should be used to create log piles on site as habitat for saproxylic invertebrates.

4.35 The semi-improved grassland habitat along the access road should be cut annually in late July/August, with all cuttings removed from this area, with the aim of maintaining it as nectar-rich semi-improved grassland suitable for invertebrates and reptiles.

Residual Effects

4.36 With the implementation of the above mitigation measures, it is considered that construction phase and residual effects of the development upon invertebrates will be **neutral.**

Reptiles

Impacts

4.37 Reptiles are considered unlikely to be on site and no further surveys are advised. However, if reptiles are present within the local area, it is possible that transitory individuals may make use of the habitats on site for basking and hibernating. There is therefore a small risk that development works could result in the death/disturbance of individual reptiles, resulting in an **adverse** impact at a **site** level.

4.38 Given the size of the area to be lost and the lack of reptiles recorded, it is highly unlikely that loss of foraging and resting habitat will have a detrimental effect on the local reptile population and therefore this is not considered to be a significant effect.

Mitigation

4.39 Vegetation clearance will be carried out in accordance with a method statement. This method statement should be produced by a suitably qualified ecologist and submitted to and approved by the local planning authority as part of a pre-commencement condition.

4.40 Any deadwood generated through vegetation removal associated with the proposed works should be retained on site as a wood pile or hibernaculum to ensure the continued provision of a potential hibernaculum.

Residual Effects

4.41 With the implementation of the above mitigation measures, it is considered that construction phase and residual effects of the development upon reptiles will be **neutral.**

Other Notable Species

Impacts

4.42 The proposal will result in a reduction in potential foraging and sheltering opportunities for European hedgehog, western polecat, and common toad, resulting in an **adverse** impact at a **site** level. Potential impacts also include death and disturbance during habitat clearance.

Mitigation

4.43 Vegetation clearance will be taken outside the hibernation period (October – March) when hedgehogs are more vulnerable; or where this is not feasible, a fingertip search and/or staged habitat removal on localised patches of habitat undertaken under a method statement. The optimum time to remove vegetation would be during September/October as this avoids both the nesting bird season and the hibernation season of reptiles, amphibians, and hedgehogs.

4.44 Western polecats are unlikely to continue using the majority of the site post-development, if they are currently present. However, the proposed buffer planting along the southern boundary will provide suitable habitat for this species and ensure continued landscape connectivity.

4.45 Mitigation for other notable species includes the retention and enhancement of boundary habitats and inclusion of hedgehog/amphibian friendly fencing. To facilitate the movement of hedgehogs and amphibians such as common toad through the site, it is one 13cm x 13cm hole will be provided within all new lengths of fencing to permit movement of hedgehogs through the site. This size gap is too small for most pets and can be undertaken by raising a fence panel per garden; installing hedgehog friendly fencing; removing a brick at the bottom of a wall or cutting a hole in fencing/walls.

Residual Effects

4.46 These mitigation measures will result in a **neutral** effect for other notable species.

5.0 Summary & Conclusions

5.1 The site is dominated by semi-improved grassland exhibiting moderate floral diversity, with scattered scrub. Most of these habitats will be lost as a result of the proposed development, however the boundary hedgerows and trees, which also offer moderate ecological interest, are due to be retained and enhanced. A summary of likely impacts, together with advised further surveys and mitigation is provided in Table 5 below.

5.2 Through the above survey and precautionary methods, it is considered that all significant impacts upon biodiversity, including any potential adverse impacts upon specific protected species, habitats and designated sites will likely be able to be wholly mitigated in line with relevant wildlife legislation, chapter 15 of the National Planning Policy Framework (MHCLG, 2019); and development control policies as set out in the Cherwell Local Plan (Cherwell District Council, 2011).

Table 5: Summary of Likely Impacts, Mitigation and Enhancement Measures and Residual Impacts

Feature	Likely impacts	Further surveys	Likely mitigation and enhancement measures	Residual effect
SSSI/LNR	No likely impacts.	N/A	No mitigation/enhancement required.	
CTA	No likely impacts.	N/A	No mitigation/enhancement required.	
Habitats	Loss of semi-improved grassland and scattered scrub. Loss of a small stretch of hedgerow for the access road and visibility splays. Lighting impacts on boundary habitats	N/A	Turf or topsoil from semi-improved grassland to be retained and spread in proposed area of public green space, to be managed by cutting annually. Planting of native species along new internal boundaries and enhancement of retained hedgerows through rotational cutting regime. Implementation of wildlife sensitive lighting.	Neutral
Badgers	Potential injury/death during construction. Loss of foraging/commuting habitat.	Pre-construction walkover, no more than six months prior to commencing works.	Precautionary construction techniques. Mitigation for the loss of foraging habitat through the provision of badger-friendly fruiting trees.	Neutral
Bats	Potential disturbance of commuting and foraging habitat.	N/A	Provision of bat boxes on new buildings. Implementation of wildlife sensitive lighting.	Positive

Feature	Likely impacts	Further surveys	Likely mitigation and enhancement measures	Residual effect
Birds	Loss or of nesting habitat in the form of scattered trees and possibly scrub.	N/A	Works to be undertaken outside of breeding bird season or after an ecologist has confirmed no active nests. Bird box installation on new buildings, targeting species of conservation concern.	Positive
Invertebrates	Death/injury, disturbance, loss of foraging habitat in the form of semi-improved grassland, and loss of a resting place/shelter due to scrub clearance.	N/A	Turf or topsoil from semi-improved grassland to be retained and spread in proposed area of public green space, to be managed by cutting annually. Boundary habitats to be retained where possible and enhanced through trimming on a two-to-five year rotational trimming regime. Dead wood generated through hedgerow/scrub clearance to be used to create log piles.	Neutral
Reptiles	Death/injury, disturbance, loss of foraging habitat in the form of semi-improved grassland, and loss of a resting place/shelter due to scrub clearance.	N/A	Vegetation clearance in accordance with an ecological method statement. Retention and enhancement of boundary habitats. Dead wood generated through hedgerow/scrub clearance to be used to create log piles.	Neutral
Other Notable Species	Loss of habitat. Injury/ and or death.	N/A	Sensitive habitat removal. Enhancement of retained boundary habitat through hedgehog-friendly planting.	Neutral

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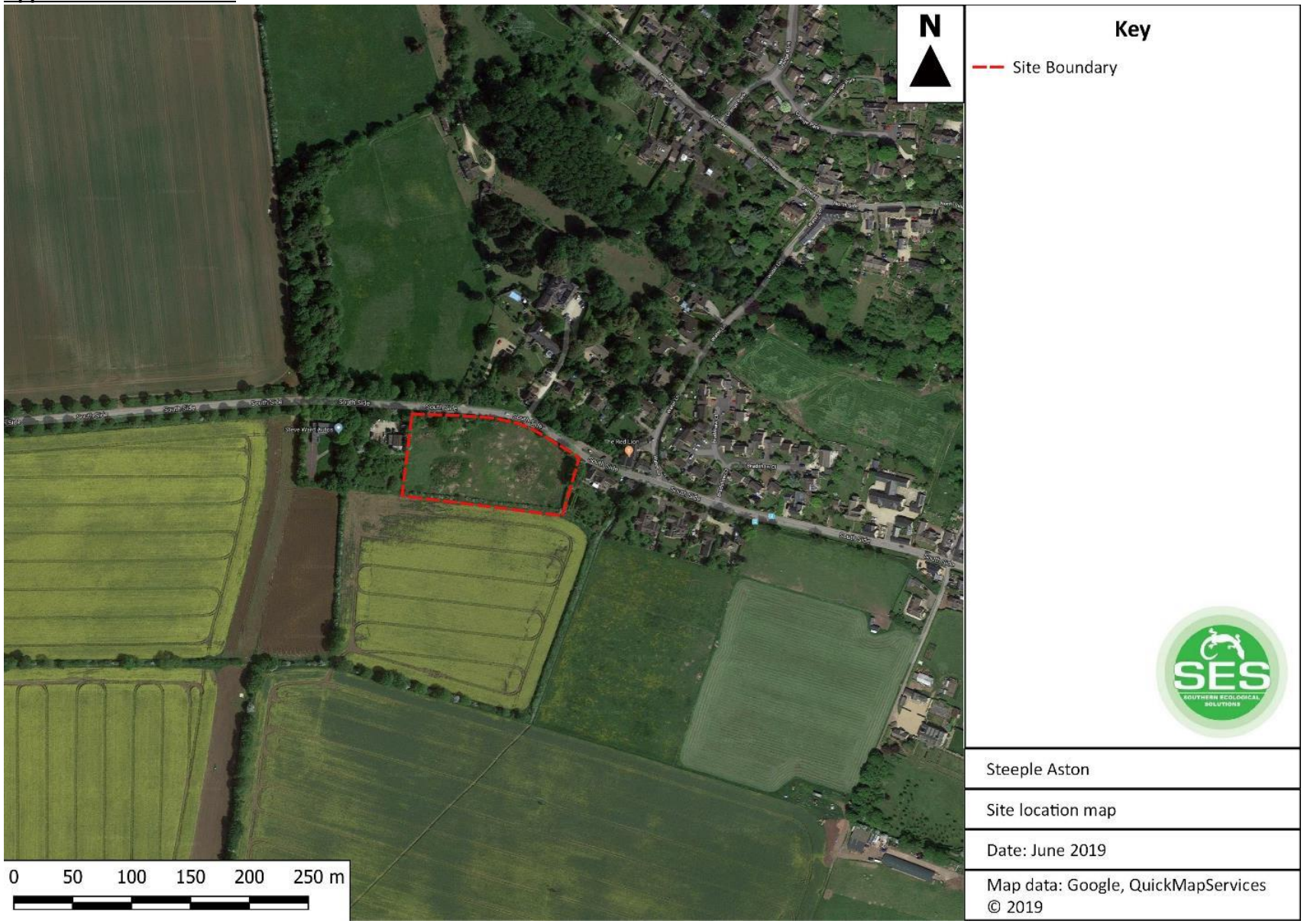
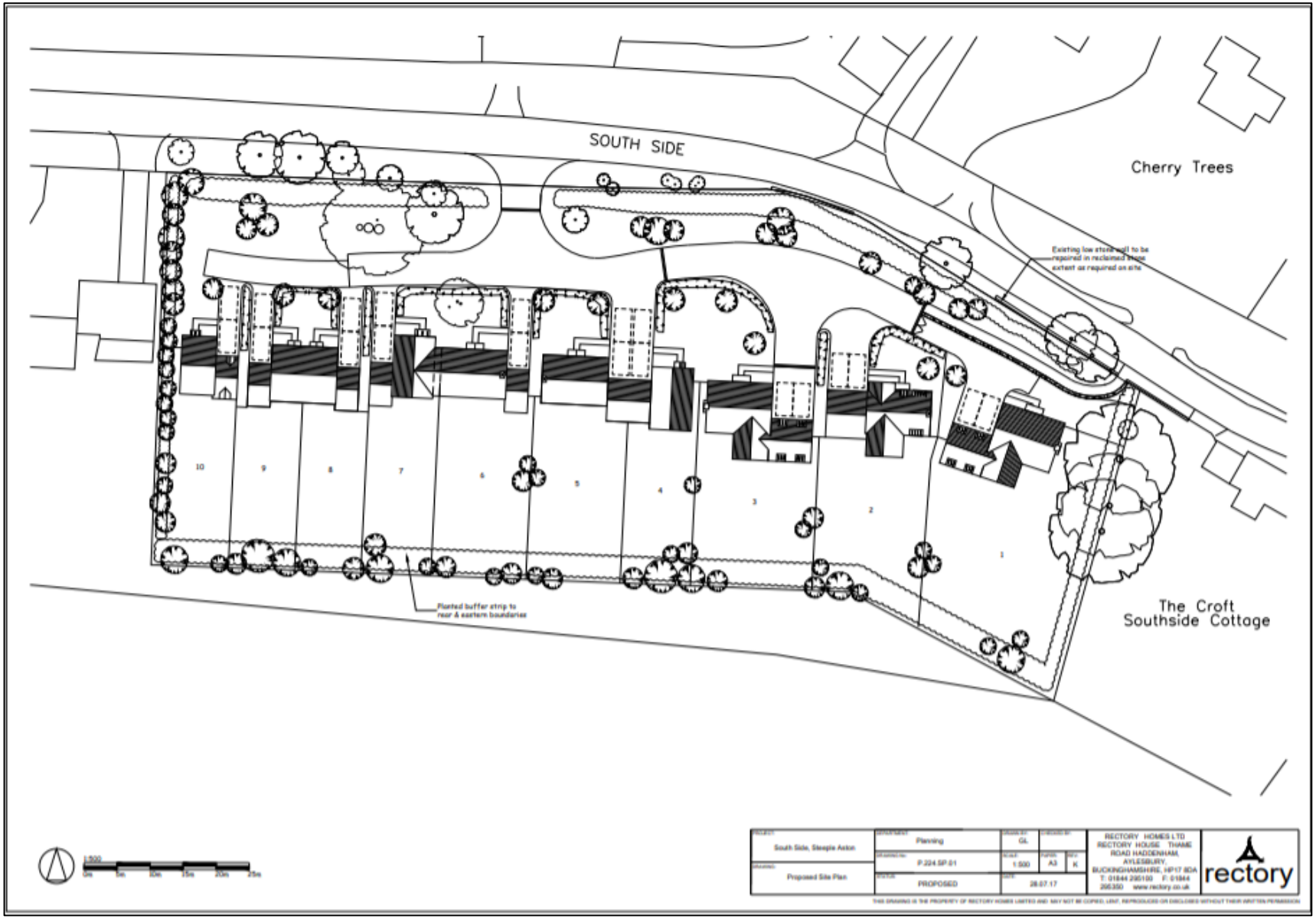
Appendix 1. Site location



Appendix 2. Proposed Site Layout



Appendix 3: Legislative and Policy Framework

National Planning Policy

The *NPPF* (MHCLG, 2019) outlines what the planning system should do to contribute to and enhance the natural and local environment through the following policy statements:

Paragraph 8
Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

c) an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Paragraph 20
Strategic policies should set out an overall strategy for the pattern, scale and quality of development, and make sufficient provision for:

d) conservation and enhancement of the natural, built and historic environment, including landscapes and green infrastructure, and planning measures to address climate change mitigation and adaptation.

Paragraph 28
Non-strategic policies should be used by local planning authorities and communities to set out more detailed policies for specific areas, neighbourhoods or types of development. This can include allocating sites, the provision of infrastructure and community facilities at a local level, establishing design principles, conserving and enhancing the natural and historic environment and setting out other development management policies.

Paragraph 102
Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:

d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and

Paragraph 118
Planning policies and decisions should:

a) encourage multiple benefits from both urban and rural land, including through mixed use schemes and taking opportunities to achieve net environmental gains – such as developments that would enable new habitat creation or improve public access to the countryside;
b) recognise that some undeveloped land can perform many functions, such as for wildlife, recreation, flood risk mitigation, cooling/shading, carbon storage or food production;

Paragraph 141
Once Green Belts have been defined, local planning authorities should plan positively to enhance their beneficial use, such as looking for opportunities to provide access; to provide opportunities for outdoor sport and recreation; to retain and enhance landscapes, visual amenity and biodiversity; or to improve damaged and derelict land.

Paragraph 170
Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);
b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;

c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate; d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;

Paragraph 174

To protect and enhance biodiversity and geodiversity, plans should:

a) Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity56; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation57; and
b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.

Paragraph 175

When determining planning applications, local planning authorities should apply the following principles:

a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;
b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;
c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons58 and a suitable compensation strategy exists; and
d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity.

Paragraph 176

The following should be given the same protection as habitats sites: a) potential Special Protection Areas and possible Special Areas of Conservation; b) listed or proposed Ramsar sites59; and c) sites identified, or required, as compensatory measures for adverse effects on habitats sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites.

Paragraph 177

The presumption in favour of sustainable development does not apply where the plan or project is likely to have a significant effect on a habitats site (either alone or in combination with other plans or projects), unless an appropriate assessment has concluded that the plan or project will not adversely affect the integrity of the habitats site.

Paragraph 180

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Local Planning Policy

The Cherwell adopted Local Plan 2011-2031 (2011) policies related to nature conservation are set out below.

Policy ESD 9: Protection of the Oxford Meadows SAC
Developers will be required to demonstrate that:

- *During construction of the development there will be no adverse effects on the water quality or quantity of any adjacent or nearby watercourse*
- *During operation of the development any run-off of water into adjacent or surrounding watercourses will meet Environmental Quality Standards(and where necessary oil interceptors, silt traps and Sustainable Drainage Systems will be included)*
- *New development will not significantly alter groundwater flows and that the hydrological regime of the Oxford Meadows SAC is maintained in terms of water quantity and quality*
- *Run-off rates of surface water from the development will be maintained at greenfield rates.*

Policy ESD 10: Protection and Enhancement of Biodiversity and the Natural Environment
Protection and enhancement of biodiversity and the natural environment will be achieved by the following:

- *In considering proposals for development, a net gain in biodiversity will be sought by protecting, managing, enhancing and extending existing resources, and by creating new resources*
- *The protection of trees will be encouraged, with an aim to increase the number of trees in the District*
- *The reuse of soils will be sought*
- *If significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or as a last resort, compensated for, then development will not be permitted.*
- *Development which would result in damage to or loss of a site of international value will be subject to the Habitats Regulations Assessment process and will not be permitted unless it can be demonstrated that there will be no likely significant effects on the international site or that effects can be mitigated*
- *Development which would result in damage to or loss of a site of biodiversity or geological value of national importance will not be permitted unless the benefits of the development clearly outweigh the harm it would cause to the site and the wider national network of SSSIs, and the loss can be mitigated to achieve a net gain in biodiversity/geodiversity*
- *Development which would result in damage to or loss of a site of biodiversity or geological value of regional or local importance including habitats of species of principal importance for biodiversity will not be permitted unless the benefits of the development clearly outweigh the harm it would cause to the site, and the loss can be mitigated to achieve a net gain in biodiversity/geodiversity*
- *Development proposals will be expected to incorporate features to encourage biodiversity, and retain and where possible enhance existing features of nature conservation value within the site.*
- *Existing ecological networks should be identified and maintained to avoid habitat fragmentation, and ecological corridors should form an essential component of green infrastructure provision in association with new development to ensure habitat connectivity*
- *Relevant habitat and species surveys and associated reports will be required to accompany planning applications which may affect a site, habitat or species of known or potential ecological value*
- *Air quality assessments will also be required for development proposals that would be likely to have a significantly adverse impact on biodiversity by generating an increase in air pollution*

- *Planning conditions/obligations will be used to secure net gains in biodiversity by helping to deliver Biodiversity Action Plan targets and/or meeting the aims of Conservation Target Areas.*
- *Developments for which these are the principal aims will be viewed favourably*
- *A monitoring and management plan will be required for biodiversity features on site to ensure their long term suitable management.*

Policy ESD 11: Conservation Target Areas
Where development is proposed within or adjacent to a Conservation Target Area biodiversity surveys and a report will be required to identify constraints and opportunities for biodiversity enhancement. Development which would prevent the aims of a Conservation Target Area being achieved will not be permitted. Where there is potential for development, the design and layout of the development, planning conditions or obligations will be used to secure biodiversity enhancement to help achieve the aims of the Conservation Target Area.

Wildlife Legislation

The two principal wildlife statutes are the Conservation of Habitats and Species Regulations (The Habitats Regulations 2017) that deals with internationally important sites and species, and the Wildlife and Countryside Act (WCA) 1981 that deals with nationally important sites and species.

Certain habitats and species within discrete sites are protected as SSSI under the WCA 1981. A proportion of these are more strictly protected as proposed or designated SPA, SAC and Ramsar sites under the Conservation of Habitats and Species Regulations (2017). These designations protect features and resources listed as being of international importance from both direct and indirect effects arising from a range of issues including proposed development. In addition, non-statutory designated sites (e.g. Local Wildlife Sites) are protected under the National Parks and Access to the Countryside Act, (1949) Section 21.

Certain species listed on Schedule 5 of the WCA 1981, including all bat species, great crested newt *Triturus cristatus,* hazel dormouse *Muscardinus avellanarius* and otter *Lutra lutra* are also protected under Schedule 2 of the Habitats Regulations 2010 making them European Protected Species (EPS). Taken together it is illegal to:

Deliberately kill, injure or capture any wild animal of EPS;
Deliberately disturb wild animals of any EPS in such a way to be likely to significantly affect:
The ability of any significant groups of animals of that species to survive, breed, rear or nurture their young; or
The local distribution of that species.
Recklessly disturb an EPS or obstruct access to their place of rest;
Damage or destroy breeding sites or resting places of such animals;
Deliberately take or destroy the eggs of such an animal;
Possess or transport any part of an EPS, unless acquired legally; and/or
Sell, barter or exchange any part of an EPS.

A range of species other than birds, including water vole *Arvicola amphibius*, is protected from disturbance and destruction under the WCA 1981 through inclusion on Schedule 5.

All breeding birds are protected from deliberate destruction under the WCA 1981. Certain species are further protected from disturbance at their nest sites being listed on Schedule 1 of the WCA 1981.

Common reptiles including common lizard *Zootoca vivipara,* slow-worm *Anguis fragilis*, grass snake *Natrix helvetica* and adder *Vipera berus* are protected under the WCA 1981, they are listed as schedule 5 species, therefore part of Section 9(1) and section 9(5) apply; the Countryside and Rights of Way Act 2000 (CRoW) also strengthens their protection.

Badger *Meles meles* is protected from sett disturbance and destruction under the Protection of Badgers Act 1992.

Section 40 of The Natural Environment and Rural Communities Act (NERC) 2006 places a legal duty on Local Authorities to conserve biodiversity. Section 41 (S41) sets out a list of 943 species and habitats of principal importance. These species are known as England Biodiversity Priority (EBP) species and are those identified as requiring action under the former UK Biodiversity Action Plan (BAP) and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework.

Native, species-rich hedgerows that fit certain criteria are protected as being 'important' under the Hedgerow Regulations (1997).

Japanese Knotweed *Fallopia japonica*, along with other introduced and invasive species are listed under Schedule 9 of the WCA 1981. Japanese knotweed is highly invasive and its rhizomes cause damage to built structures. Hence it is also classed as controlled waste under the Environment Protection Act 1990 and has therefore either to be removed or disposed of in a licensed landfill or the rhizomes buried to a depth of at least 5m.

Appendix 4. Detailed Methods

Great crested newt Habitat Suitability Index

The HSI for the great crested newt was developed by Oldham et al (2000). An HSI is a numerical index, between 0 and 1. 0 indicates unsuitable habitat, 1 represents optimal habitat. The HSI for the great crested newt incorporates 10 suitability indices, all of which are factors thought to influence the likelihood of great crested newt presence (*e.g.* surrounding habitat, geographical location, shading, presence of waterfowl and fish).

The HSI is calculated as a geometric mean of the 10 suitability indices (SI) as indicated below:

- Geographic locality
- Pond area
- Permanence
- Water quality
- Shade
- Waterfowl presence
- Fish presence
- Pond count within 1km2 of survey pond
- Terrestrial habitat quality
- Macrophyte cover

HSI = (SI1 x SI2 x SI3 x SI4 x SI5 x SI6 x SI7 x SI8 x SI9 x SI10) 1/10

The data regarding each factor is collected in the field at each pond and also by using maps, this is then converted into SI scores on a scale of 0.1 - 1.0. The results can then be used to calculate the HSI. In general ponds with high HSI scores are more likely to support great crested newts than those with low scores (Table 6).

Table 6: HSI score categories (Oldham et al., 2000)

HSI score	Pond suitability
< 0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good
> 0.8	Excellent

The HSI for great crested newt is a measure of habitat suitability. It is not a substitute for newt surveys. In general, ponds with high HSI scores are more likely to support great crested newt than those with low scores. However, the system is not sufficiently precise to allow the conclusion that any particular pond with a high score will support newts, or that any pond with a low score will not do so. There is also a positive correlation between HSI scores and the numbers of great crested newt observed in ponds. So, in general, high HSI scores are likely to be associated with greater numbers of great crested newt. The relationship however is not sufficiently strong to allow predictions to be made about the numbers of newts in any particular pond. HSI scoring of ponds can be useful when:

- Evaluating the general suitability of a pond or group of ponds to support great crested newt;
- Comparing ponds across different areas of a site or within the landscape;
- Evaluating the suitability of ponds to be used as receptor sites for great crested newt;

- Planning restorative or enhancement works to ponds.

Lee Brady developed a system of using HSI scores to define ponds suitability for great crested newts on a categorical scale during a study undertaken in south-east England in which 248 ponds were surveyed for great crested newt using standard methods and also subjected to an HSI. The results of this study show that as the HSI score increases, the proportion of ponds occupied also increases, as summarised below:

Table 7: HSI Range, Associated Pond Suitability and Predicted Presence of Great Crested Newts

HSI Range	Pond Suitability	Predicted presence of great crested newt (% of ponds occupied n=248)
<0.5	Poor	0.03
0.5 - 0.59	Below average	0.2
0.6-0.69	Average	0.55
0.7-0.79	Good	0.79

Preliminary bat roost assessment

All potential roosting habitats (existing buildings and trees) were assigned a level of suitability according to the descriptions outlined in the table below. Trees and building exteriors were initially assessed from ground level, using binoculars where necessary to identify potential roost features and bat access points. Building interiors were searched for evidence of roosting bats using a high-powered torch. Evidence of bat occupation sought included the physical presence of bats, droppings, urine staining and mammalian fur oil staining.

The site as a whole was also assigned a level of suitability for foraging and commuting bats according to the descriptions outlined below.

Table 8: Assessment of the potential suitability of a proposed development site for roosting, foraging and commuting bats (Collins, 2016)

Suitability	Roosting habitats	Commuting and foraging habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats	Negligible habitat features on site likely to be used by commuting and foraging bats
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically but not enough space, shelter, protection and appropriate conditions to be used on a regular basis or by larger numbers of bats A tree of sufficient size and age to contain potential roosting features but with none seen from the ground or features seen with only very limited roosting potential	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by another habitat Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or patch of scrub
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water

Suitability	Roosting habitats	Commuting and foraging habitats
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge High-quality habitat that is well-connected to the wider landscape that is likely used regularly by foraging bats such as broad-leaved woodland, tree-lined watercourses and grazed parkland Site is close to and connected to known roosts

Bat emergence/re-entry surveys

Bat emergence/re-entry surveys of the existing barn have been carried out in accordance with current guidance (Collins, 2016). This recommends:

- One dusk emergence or dawn re-entry survey, carried out between May-August, for structures assessed as having a 'low' suitability to support roosting bats
- Two surveys, one dusk emergence and one dawn re-entry, carried out at least two weeks apart between May-September (with at least one between May-August), for structures assessed as having a 'moderate' suitability to support roosting bats
- Three surveys, including at least one dusk emergence and one dawn re-entry, carried out a minimum of two weeks apart between May-September (with at least two between May-August), for structures assessed as having a 'high' suitability to support roosting bats or containing a confirmed bat roost

Dusk emergence surveys commenced 15 minutes before sunset and continued until approximately 1.5 hours after sunset. The survey was carried out under appropriate weather conditions, avoiding cold nights and those with strong winds or persistent rain.

In each case four surveyors maintained static positions around the barn, focusing their attention on features that could potentially be utilised by roosting bats and watching closely for any emergence or re-entry, while also recording activity incidentally observed in the immediate surroundings.

Surveyors used Batbox Duet bat detectors with Edirol digital recorders and Batbox Duet bat detectors to record bat activity. Bat calls were subsequently analysed using BatSound computer software.

Reptile surveys

Visits were undertaken during 'suitable' days for reptile activity; a 'suitable' survey day is determined by the weather, with temperature being the pre-eminent factor. Artificial refuges (0.5m x 0.5m felt squares) were laid in suitable habitat using the surveyor's professional judgement. Artificial refuges were used to observe reptiles basking or taking refuge, these were laid in transects and left for seven days to settle before the survey commenced. The refuges positions and survey results are shown in Appendix 9.

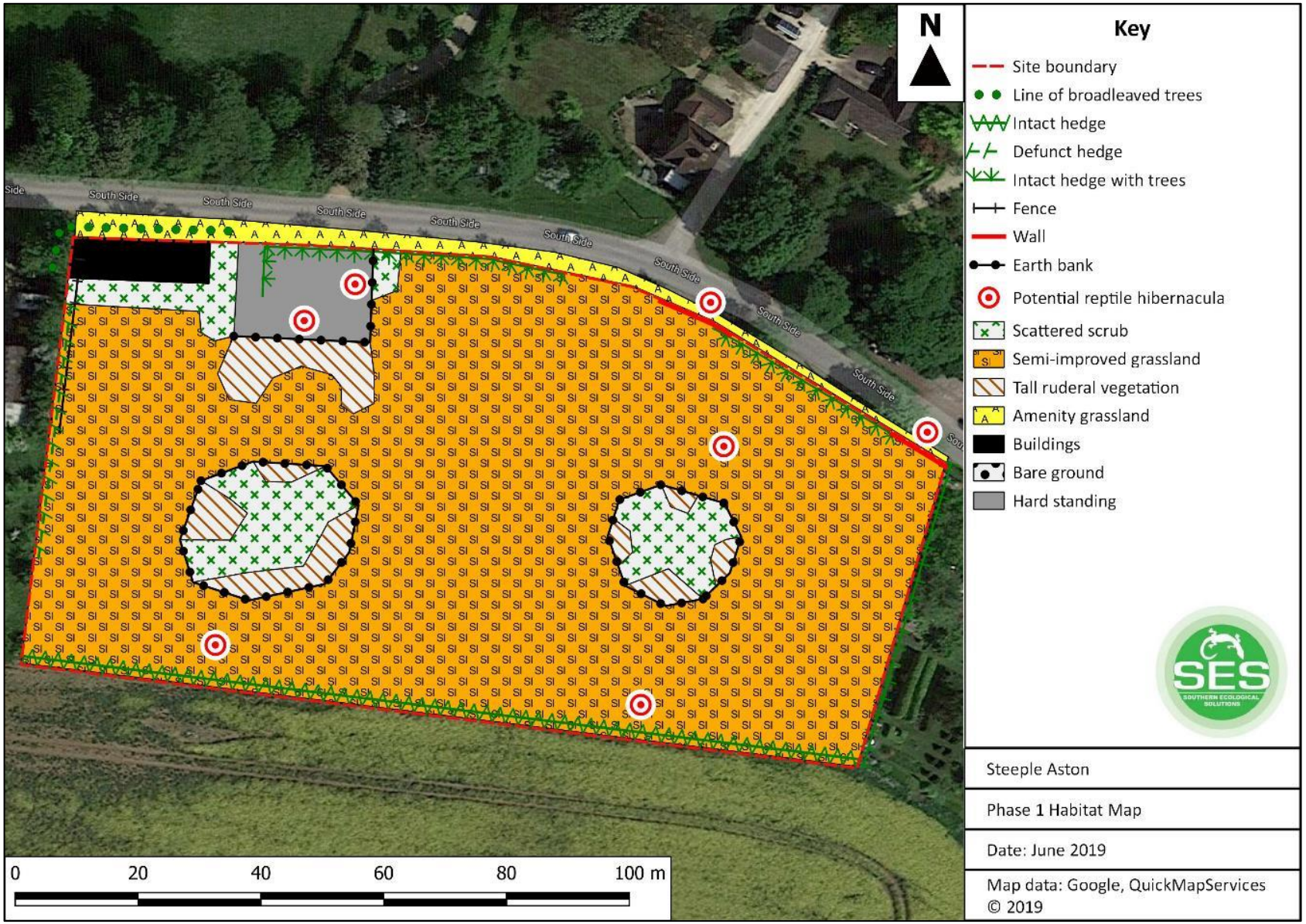
Ambient air temperature is an essential factor for reptile surveys after suitable habitat has been located. Reptile surveys conducted between 10 and 17°C have the most chance of success. The key months for reptile surveys are April, May and September with April and May being advantageous because it is reptile mating season, which means they will be more obvious and less wary of observers. Also, the temperatures are generally lower during these months and as such it will take longer for the reptiles to warm up so they must spend more time basking. During the warmer summer months animals will have to spend less time basking due to the increase in ambient temperature, thus reptile survey visits will be conducted earlier in the day during the hotter summer months. However, the temperature on the day of the visit will ultimately determine what time the survey takes place. Survey timings and weather conditions are provided in Appendix 9.

A categorical population assessment was carried out with the largest count within the first seven visits indicating the category (low, good or exceptional) of the recorded reptile species. This survey methodology is recognised as best practice by Froglife (1999) and the Herpetofauna Worker's Manual (Gent and Gibson, 2003). As described above, following guidelines set out by Froglife (1999) it is possible to assess the population size using the maximum number of adult animals seen per survey visit. This method is based on refuges being placed at a density of up to 10/ha.
Table **9** below details the assessment categories.

Table 9. Froglife population assessment for reptiles found on site

Species	Low Population	Good Population	Exceptional Population
Grass Snake	<5	5-10	>10
Common lizard	<5	5-20	>20

Appendix 5: Phase 1 Habitat Map



Appendix 6: Plant Species List and Relative Abundance

Common name	Latin name	Line of Trees	Amenity grassland roadside verge	Species-rich hedgerow with trees (north hedge)	Species-rich hedgerow (south hedge)	Intact species-poor hedgerow with trees (east hedge)	Defunct species-rich hedgerow (west hedge)	Semi-improved grassland with scattered young tree growth	Scattered scrub	Tall ruderal vegetation	Hard standing with ephemeral weeds
Alder buckthorn	*Rhamnus frangula*				O						
Ash	*Fraxinus excelsior*	O		O	O		A	O	F		
Barren brome	*Bromus sterilis*							O			
Beech	*Fagus sylvatica*					A					
Black medick	*Medicago lupulina*							F			
Blackthorn	*Prunus spinosa*			F	O		O	R			
Bramble	*Rubus fruticosus*	O					O	O	F		
Broad-leaved dock	*Rumex obtusifolius*	O	O	F							O
Buckthorn	*Rhamnus cathartica*				F						
Buddleia	*Buddleja davidii*										R
Cleavers	*Galium aparine*	O		A						R	
Cocksfoot	*Dactylis glomerata*		A					F			
Common field speedwell	*Veronica persica*							O			
Common mouse ear chickweed	*Cerastium fontanum*							F			
Common nettle	*Urtica dioica*	O		A			O	O		D	R
Common spotted orchid	*Dactylorhiza fuchsii*							R			
Common vetch	*Vicia sativa*		O					F			
Couchgrass	*Elymus repens*		O								
Cow parsley	*Anthriscus sylvestris*	F									
Cowslip	*Primula veris*							O			
Crack willow	*Salix fragilis*								R		
Creeping buttercup	*Ranunculus repens*		O					O			
Creeping thistle	*Cirsium arvense*		R					O			R
Cut-leaved cranesbill	*Geranium dissectum*	O	O					O			

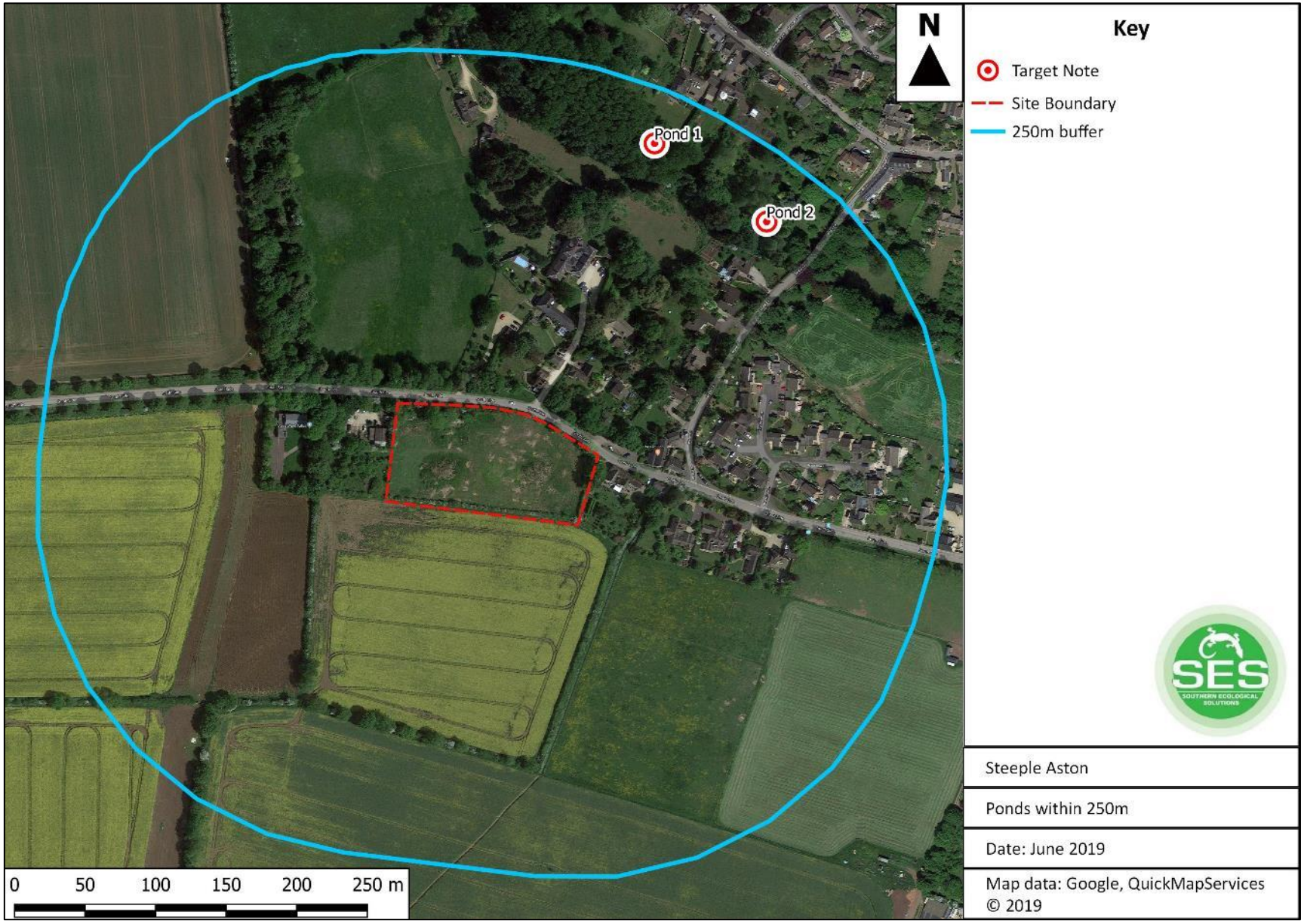
Common name	Latin name	Line of Trees	Amenity grassland roadside verge	Species-rich hedgerow with trees (north hedge)	Species-rich hedgerow (south hedge)	Intact species-poor hedgerow with trees (east hedge)	Defunct species-rich hedgerow (west hedge)	Semi-improved grassland with scattered young tree growth	Scattered scrub	Tall ruderal vegetation	Hard standing with ephemeral weeds
Daisy	*Bellis perennis*		R					O			
Damson	*Prunus domestica subsp. insititia*				R		F				
Dandelion	*Taraxacum officinale*		F								
Dog rose	*Rosa canina*				O						
Dove's foot cranesbill	*Geranium mole*							R			F
Elder	*Sambucus nigra*	R		F					O		
False brome	*Brachypodium sylvaticum*							O			
Annual fescue	*Vulpia sp.*							O			
False oat-grass	*Arrhenatherum elatius*							R			
Field maple	*Acer campestre*						F	R			
Field forget-me-not	*Myosotis arvensis*		O	R				F			
Goat willow	*Salix caprea*						R				
Goatsbeard/salsify	*Tragopogon sp.*							R			
Great mullein	*Verbascum thapsus*										
Great willowherb	*Epilobium hirsutum*							O			
Greater plantain	*Plantago major*		O					O			
Green alkanet	*Pentaglottis sempervirens*							R			R
Grey willow	*Salix cinerea*							R	R		
Ground ivy	*Glechoma hederacea*							O			
Groundsel	*Senecio vulgaris*		R								R
Hairy tare	*Vicia hirsuta*							F			
Hawkweed species	*Hieracium sp.*							R			
Hawthorn	*Crataegus monogyna*	F		A	A		O	O			
Hazel	*Corylus avellana*			F							
Hedge bindweed	*Calystegia sepium*	R									

Common name	Latin name	Line of Trees	Amenity grassland roadside verge	Species-rich hedgerow with trees (north hedge)	Species-rich hedgerow (south hedge)	Intact species-poor hedgerow with trees (east hedge)	Defunct species-rich hedgerow (west hedge)	Semi-improved grassland with scattered young tree growth	Scattered scrub	Tall ruderal vegetation	Hard standing with ephemeral weeds
Hedge woundwort	*Stachys sylvatica*							O			
Herb-robert	*Geranium robertianum*		O	O							O
Honeysuckle species	*Lonicera sp.*							R			
Ivy	*Hedera helix*	A		A							
Meadow buttercup	*Ranunculus acris*							O			R
Laurel	*Laurus nobilis*							R			
Lesser burdock	*Arctium minus*	O									O
Poppy species	*Papaver sp.*							R			
Portuguese laurel	*Prunus lusitanica*					F					
Purple loostrife	*Lythrum salicaria*							R			
Pyramidal orchid	*Anacamptis pyramidalis*							O			
Ragged robin	*Lychnis flos-cuculi*							R			
Ragwort	*Jacobaea vulgaris*							O			
Red clover	*Trifolium pratense*							R			
Ribwort plantain	*Plantago lanceolata*		O					F			
Rose species	*Rosa sp.*				R						
Rosebay willowherb	*Chamerion angustifolium*							F			
Rough hawkbit	*Leontodon hispidus*							F			
Rough meadow-grass	*Poa trivialis*		A					F			
Silver birch	*Betula pendula*							R			
Smooth sow-thistle	*Sonchus oleraceus*										O
Smooth tare	*Vicia tetrasperma*							R			
Soft brome	*Bromus hordeaceus*							O			
Spear thistle	*Cirsium vulgare*										R
Sweet violet	*Viola odorata*							O			
Sycamore	*Acer pseudoplatanus*	F		R			O	O	F		

Common name	Latin name	Line of Trees	Amenity grassland roadside verge	Species-rich hedgerow with trees (north hedge)	Species-rich hedgerow (south hedge)	Intact species-poor hedgerow with trees (east hedge)	Defunct species-rich hedgerow (west hedge)	Semi-improved grassland with scattered young tree growth	Scattered scrub	Tall ruderal vegetation	Hard standing with ephemeral weeds
Tall fescue	*Festuca arundinacea*							A			
Traveller's joy	*Clematis vitalba*				A	O		O	O		
Tutsan	*Hypericum androsaemum*							R			
Wild cherry	*Prunus avium*				O		R				
Wild strawberry	*Fragaria vesca*							R			
Willow species	*Salix sp.*							O			
Wood avens	*Geum urbanum*						O	O			
Woody nightshade	*Solanum dulcamara*										O
White clover	*Trifolium repens*							O			
White dead nettle	*Lamium album*		R								
Yorkshire fog	*Holcus lanatus*							O			

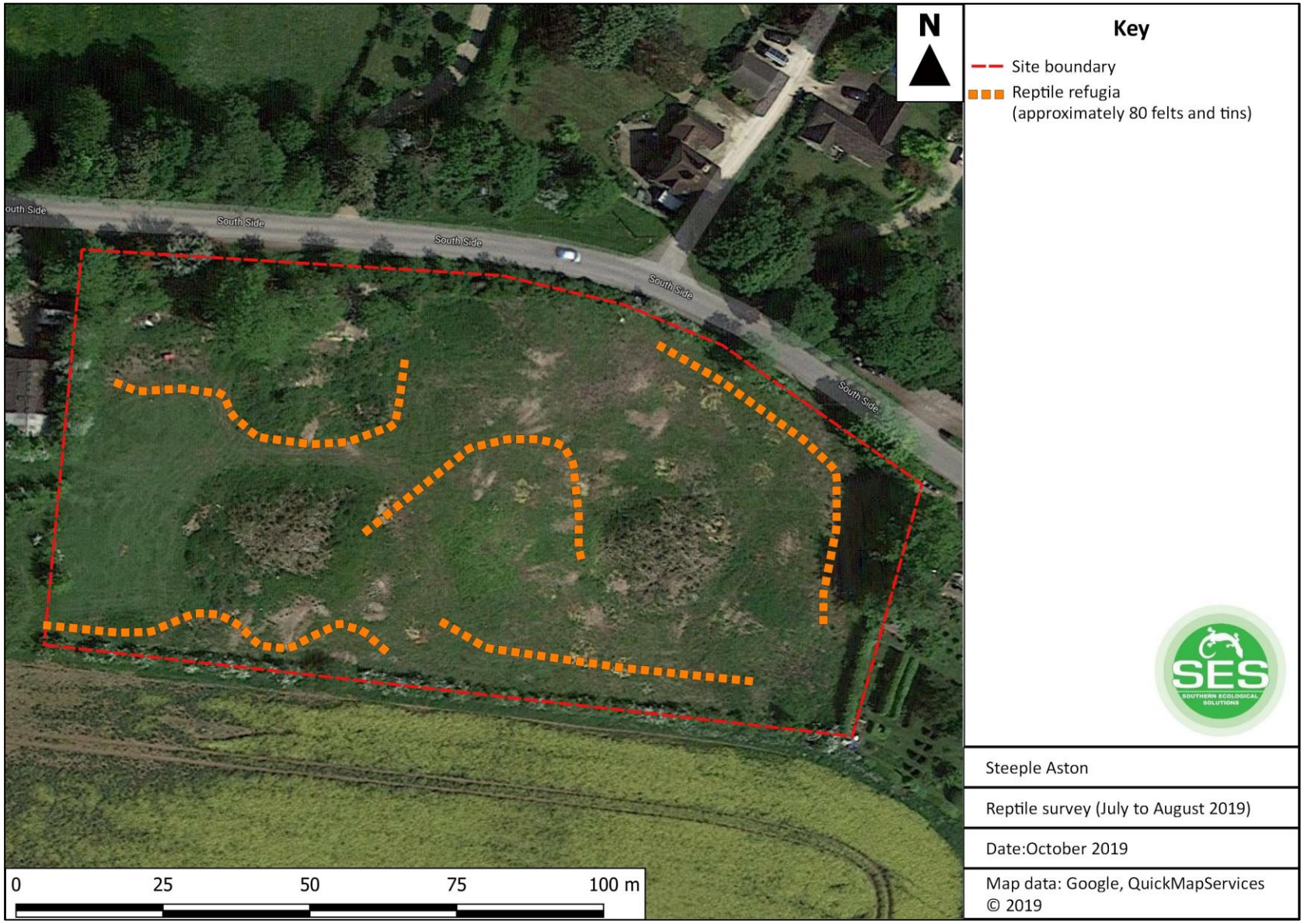
Appendix 7: Emergence survey surveyor positions (24 June 2019)

Appendix 8: Ponds within 250m



Appendix 9: Reptile survey July – August 2019

Appendix 9a: Reptile refugia plan



Appendix 9b: Reptile survey results

Survey number	Refugia	Date	Temp	Cloud %	Wind (Beaufort)	Last rain	Slow Worm				Common Lizard				Grass snake		Adder			
							M	F	T	J	M	F	T	J	Ad	J	M	F	T	J
1	1	05-Jul	16	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total						0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	08-Jul	16	70	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total						0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	15-Jul	16	70	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total						0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1	02-Aug	14	80	2	2h before	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total						0	0	0	0	0	0	0	0	0	0	0	0	0	0

Survey number	Refugia	Date	Temp	Cloud %	Wind (Beaufort)	Last rain	Slow Worm				Common Lizard				Grass snake		Adder			
							M	F	T	J	M	F	T	J	Ad	J	M	F	T	J
5	1	19-Aug	16	50	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total						0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1	21-Aug	16	80	3	>24hrs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total						0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	27-Aug	15	50	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5						0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total						0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 10: Plant species of known benefit to bats

The following table is reproduced from *Gunnell, K., Grant, G. and Williams, C. (2012). Landscape and Urban Design for Bats and Biodiversity, Bat Conservation Trust*. This suggests plant species that can provide benefit for bats by either providing a food source for insects and/or roost potential. The plants listed are predominately native to Britain. The small group of non-native plants included for their documented value for wildlife. This list has been checked against Natural England's list of invasive non-native plants.

Plant species	Common name	Native (N)	Type	Benefit	Soil	Light	Extensive green roofs	Living walls	Rain gardens	Hedge/ trees	Beds/ borders
Acer campestre	Field maple	N	T/S	C	Any	Sun/ shade				Y	
Acer platanoides	Norway maple		T	S	Well drained/ alkaline	Sun/ shade				Y	
Acer saooharum	Sugar maple		T	S	Any	Sun/ shade				Y	
Achillea millefolium	Yarrow	N	HP	C,F	Well drained	Sun				Y	
Ajuga reptans	Bugle	N	HP	C,F	Any	Sun/ shade	Y		Y		
Anthyllis vulneraria	Kidney vetch	N	HP	F	Well drained	Sun	Y				
Aubrieta deltoidea	Aubrieta		H	F	Well drained	Sun/shade		Y			
Betula pendula	Sliver birch	N	T	C	Sandy/ acid	Sun				Y	
Cardamine pratensis	Cuckoo- flower	N	HP	F	Moist	Sun/ shade			Y		Y
Carpinus betulus	Hornbeam	N	T	C	Clay	Sun				Y	
Centaurea nigra	Common knapweed	N	HP	C,F	Dry, not acid	Sun	Y				Y
Centranthus ruber	Red valerian		HP	F	Well drained	Sun	Y				Y
Clematis vitalba	Old man's Beard	N	C	F	well drained/ alkaline	Sun				Y	
Corylus avellana	Hazel	N	S	C	Any dry	Sun/ shade		Y		Y	
Crataegus monogyna	Hawthorn	N	S	S,C	Any	Sun/shade				Y	
Daucus carota	Wild carrot	N	Bi	S,C,F	Any	Sun	Y				Y
Dianthus spp.	Pinks	N	A-Bi	F	Well drained	Sun	Y	Y			Y
Digitalis purpurea	Foxglove	N	Bi	C	Well drained	Shade/ partial shade				Y	Y
Erica cinera	Bell heather	N	S	F	Sandy	Full sun					Y
Ersimum cherira	Wallflower		Bi-P	F	Well drained	Sun		Y			Y
Eupatorium	Hemp agrimony	N	H	F	Moist	Sun/ shade			Y		Y
Fagus sylvatica	Beech	N	T	C, R	Well drained alkaline	Sun/shade				Y	
Foeniculum vulgare	Fennel		H	F	Well drained	Sun					Y
Fraxinus excelsior	Common Ash	N	T	C, R	Any	Sun/ shade				Y	
Hebe spp.	Hebe species		S	F	Well drained	Sun /shade				Y	Y

Plant species	Common name	Native (N)	Type	Benefit	Soil	Light	Extensive green roofs	Living walls	Rain gardens	Hedge/ trees	Beds/ borders
Hedera Helix	Ivy	N	C	F,C	Any	Sun/ shade		Y	Y	Y	Y
Hesperis matrionalis	Sweet Rocket		H	F	Well drained/ dry	Sun/ shade					Y
Hyacinthoides non -scripta	Bluebell	N	B	F	Loam	Shade/ partial shade		Y		Y	Y
Ilex aquailfolium	Holly	N	T	C	Any	Sun/ shade				Y	
Jasmine officinale	Common jasmine		C	F	Well drained	Sun		Y			Y
Lavandula spp.	Lavender species		S	F	Well drained / sandy	Sun		Y			Y
Linaria vulgaris	Toadflax	N	HP	C	Well drained/ alkaline	Sun	Y				Y
Lonicera periclymenum	Honeysuckle	N	C	F	Well drained	Sun		Y		Y	
Lotus corniculatus	Bird's foot trefoil	N	HP	F	Well drained/ dry	Sun	Y				Y
Lunaria annua	Honesty		Bi	F	Any	Sun/ partial shade	Y				Y
Malus spp.	Apple		T	C	Any	Sun				Y	Y
Matthiola longipetala	Night - scented stock		A	F	Well drained/ moist				Y		Y
Myosotis spp.	Forget me not species	N	A	F	Any	Sun	Y	Y			Y
Nicotiania alata	Ornamental tobacco		A	F	Well drained moist	Sun /partial shade			Y		Y
Oneothera spp.	Evening primrose		Bi	F	Well drained	Sun	Y				Y
Origanum vulgare	Marjoram	N	HP	F	Well drained / dry	Sun				Y	
Populus alba	White poplar	N	T	C	Clay loam	Sun				Y	
Primula veris	Cowslip	N	HP	F	Well drained/ moist	Sun/ partial shade	Y				Y
Primula vulgaris	Primrose	N	HP	F	Moist	Partial shade	Y	Y		Y	Y
Prunus avium	Wild cherry	N	T	C	Any	Sun				Y	Y
Prunus domestica	Plum		T	C	Well drained/ moist	Sun				Y	Y
Prunus spinosa	Blackthorn	N	S	C	Any	Sun/ partial shade				Y	
Querois petraea	Sessile oak	N	T	C,R	Sandy loam	Sun/ shade				Y	
Quercus robur	Common oak	N	T	R	Clay Loam	Sun/ shade				Y	
Rosa canina	Dog rose	N	S	C	Any	Sun			Y	Y	Y
Salix spp.	Willow species	N	S	S,C	Moist	Sun/ shade			Y	Y	
Sambucus nigra	Elder	N	T	C	Clay loam	Sun				Y	
Saponaria officinalis	Soapwort	N	HP	F	Any	Sun					Y
Saxifraga oppositifolia	saxifage	N	HP	C	Well drained	Sun	Y	Y			Y

Plant species	Common name	Native (N)	Type	Benefit	Soil	Light	Extensive green roofs	Living walls	Rain gardens	Hedge/ trees	Beds/ borders
Scabiosa columbaria	small scabious	N	HP	F	Well drained/ alkaline	Sun	Y				Y
Sedum spectabile	Ice plant		HP	F	Well drained/ dry	Sun	Y				Y
Silene dioecia	Red campion	N	HP	F	Any	Shade/ partial shade		Y	Y	Y	Y
Sorbus aucuparia	Rowan	N	T	C	Well drained	Sun				Y	
Stachys lanata	Lamb's ear		HP	F	Well drained/ dry	Sun					Y
Symphotrichum spp.	Michalemas daisies		HP	F	Any	Sun					Y
Tages patula	French marigold		A	F	Well drained	Sun					Y
Thymus serpyllum	Creeping thyme	N	HP/S	F	Well drained/ dry	Sun	Y	Y			Y
Tilia x europaea	Common lime		T	C	Any	Sun/ shade				Y	
Trifolium spp.	Clover species	N	H	F	Any	Sun	Y				Y
Valerina spp.	Valerian species	N	HP	F	Moist	Sun/ partial shade			Y		Y
Verbascum spp.	Mulliens	N	Bi, HP	C	Well drained	Sun					Y
Verbena bonariensis	Verbena		HP	F	Well drained/moist	Sun					Y
Viburnum lantana	Wayfaring tree	N	S	C	Any	Sun/ shade				Y	Y
Viburnum opulus	Guelder rose	N	S	C	Moist	Sun/ shade			Y	Y	
Viola tricolor	Pansy	N	A	F	Well drained/ moist		Y	Y			Y

Legend

Type		Benefit	
HP	Herbaceous perennial	C	Moth caterpillar food plant
Bi	Biennial	S	Sap sucking insects (e.g. whiteflies)
BiP	Biennial perennial	F	Flowers attract adult moths
T	Tree	E	Good roost potential
S	Shrub		
H	Herb		
A	Annual		
B	Bulb		
	Creeper/ climber		